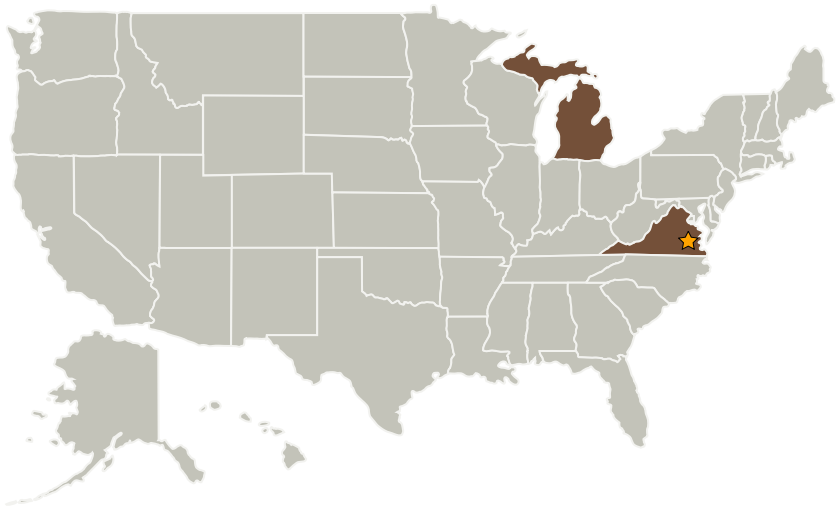
Hybrid Finite Element Developments for Rotorcraft Interior Noise Computations within a Multidisciplinary Design Environment, Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

One of the main attributes contributing to the civil competitiveness of rotorcraft, is the continuously increasing expectations for passenger comfort which is directly related with reduced vibration levels and reduced interior noise levels. Such expectations are amplified in the VIP market where people are used in the acoustic and vibration levels of civil and executive jets. One of the most critical excitations for interior noise in helicopters is the one from the gearbox. Thus, the structure-borne noise path (i.e. excitation propagating from mounting locations through the fuselage structure to the panels of the cabin and to the interior) must be captured in rotorcraft interior noise computations. This proposal addresses the need stated in the solicitation for developing physics based tools that can be used within a multi-disciplinary design-analysis-optimization for computing interior noise in rotorcraft applications. The hybrid FEA method can be used for structure-borne helicopter applications and can be integrated very easily (due to the finite element based model) with models from other disciplines within a multidisciplinary design environment. During the Phase I project the main focus will be in demonstrating the feasibility of the hybrid FEA technology for computing rotorcraft structure-borne interior noise from gearbox excitation. A multi-discipline optimization rotorcraft case study will also be performed for demonstrating how the hybrid FEA facilitates the design of a rotorcraft fuselage based on simultaneous crash landing/passenger safety and structure-borne noise considerations. The new developments will become part of MES' commercial EFEA code and of its implementation within SOL400 of NASTRAN. UTRC will participate in the proposed effort for ensuring relevance of the work to rotorcraft interests and for providing technical consultancy.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Michigan Engineering Services, LLC	Supporting Organization	Industry Women-Owned Small Business (WOSB)	Ann Arbor, Michigan

Primary U.S. Work Locations	
Michigan	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.4 Aeroacoustics